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To: vss@FEC
cc: erik@design.caltech.edu, rma@hss.caltech.edu, mksikora@hss.caltech.edu, cstewart@mit.edu, sda@mit.edu
Subject: To Penelope Bonsall: public comment on draft VSS

Dear Penelope,

Please find enclosed a five-page PDF document containing the comments of the Caltech-MIT Voting Technology Project on the second round draft VSS. I realize that our comments are coming in late, but I hope they can be included, and we hope that you find them helpful. Let me add that we are in favor of public hearings about these standards.

Thank you again for taking the time to participate in the VTP conference on standards two weeks ago, which was sponsored by AAAS and funded by the National Science Foundation. It was great to meet you and to hear your perspective first hand. We are extremely pleased that you have been taking the lead in producing these new standards.

Sincerely,
Tom Palfrey



- VSS-2_Comments.pdf

Caltech-MIT Voting Technology Project

Comments on the Federal Election Commission's Draft Voting System Standards of December 13, 2001

Overview: The current Draft VSS addresses issues of great importance to the integrity of voting systems in U. S. federal elections, and as with the 1990 VSS, will result in more reliable voting. The Draft of 12/13/01 includes many improvements over the earlier Draft, and the Caltech-MIT VTP notes with appreciation that many of its earlier recommendations have been incorporated. However, as with the first Draft of the revised standards, the current Draft misses a number of key ingredients for a successful approach to standards and certification. We offer the following comments that we hope will lead to further improvements in the federal Voting System Standards.

I. General Comments on the 12/13/01 DRAFT Voting System Standards

1. **Human Interface and Usability** are commented upon on Page 6 of the *Voting Systems Performance and Test Standards: An Overview*. This paragraph indicates that the "FEC has begun the development of the next module to the Standards, which will focus on interface and usability issues ..." Because of the importance of these issues to both election officials and the general public, it is crucial for the FEC to indicate the timeline and process it plans to follow for developing and publishing standards in this area.
2. **Human testing** of the "end-to-end" efficacy of voting systems should be incorporated into this revision of the VSS. This is crucial to assessing how well a voting system captures and records voter intent. There are many ways to do this. For example, one could conduct a mock election, with a complexity equivalent to a typical election in the previous election cycle. The voters and pollworkers in the mock election would be a representative sample from the population. Comparison of the tally produced by the voting system under test could be compared to the results of a questionnaire completed by each of the test voters. The VSS should address this matter explicitly, and include such testing as part of the Standard.
3. **Voter Intent:** The current FEC standards and the Draft VSS are both important elements of ensuring the integrity of the national voting system. However, trust in the voting system by the voting public can only be established by both ensuring that there is no data corruption or loss (as is addressed by the Draft VSS), and that voters' intent is being properly captured. This second crucial element should be explicitly addressed the VSS.

4. **Incorporate existing technical standards:** The VSS should incorporate by reference relevant existing standards of independent national standards-setting organizations. For example, standards relating to computer data representation, storage, communication and processing that have been developed by the IEEE (and sanctioned by the ANSI) should be incorporated into the VSS by reference. Standards relating to electrical safety and user safety developed by Underwriters Laboratories should be incorporated into the VSS by reference. This same guideline applies in other areas, including usability and access for disabled voters.
5. **Voter instructions** are only briefly mentioned in the Draft VSS. However, a standard on the acceptable complexity and/or length of instructions required by voters to successfully vote should be established.
6. **Mandatory compliance** with the VSS for all federal elections is essential. The current system of voluntary compliance is ineffective and leads to great disparities across states in election procedures and system performance. While voluntary compliance with the VSS is useful in moving the nation's voting systems towards greater reliability, public trust in election results requires that all voting systems used in federal elections be demonstrated to operate in compliance with the VSS.
7. **Internet voting:** Detailed standards for Internet voting are correctly left out of the Draft VSS, as we argued in our comments about the previous draft. However, the VSS should articulate a timeline and process for the development of Internet voting standards, either independent of future development of the VSS or as part of the next iteration of the VSS. Such a timeline should be added to the current VSS. While Internet voting has not been developed to the point where developing standards is either productive or necessary, it is important to now develop a framework for the development of Internet voting standards.

II. Detailed Comments in the 12/13/01 Draft VSS.

1. **Target vs. Testing error rate:** Page 6 of the *Voting Systems Performance and Test Standards: An Overview* sets levels for each of these two error rates. Section 3.2.1 also discusses these two error rates. However, where each of these two rates would be applied during the testing process is not made clear. It appears that the "testing error rate" is the governing standard, and that the "target error rate" is (perhaps) an ideal goal, not a standard. The difference between these two error rates should be made clear; otherwise, all reference to the "target error rate" should be eliminated from the Standard.
2. **2.2.2.1.c Common Standards: Record each vote precisely as cast ...** In view of the current Draft VSS explicit statement that it does not address issues of how accurately voting systems record voter intent, this requirement is inconsistent. There is no standard to determine whether a vote is recorded "precisely as cast". In view of the statements in the *Overview*, it appears that the intent of this element

of the standard is to require that "all systems shall record each vote precisely *as indicated by the voter...*"

3. **2.2.10 Telecommunications, Voter Authentication:** This item should make clear that any information that identifies the identity of a voter be irrevocably separated from the vote itself. Section 5.1.3 needs a similar clarification. Such separation is required by 2.4.3.1.c, 2.4.3.2.1.d., and 2.4.3.3.q. However, Section 2.2.11 indicates that (1.) information reflecting the identity of those who cast ballots must be preserved for 22 months for audit purposes. The irrevocable separation of voter identity information from the vote itself should be made clear in Section 2.2.10. Instead of sending the voter identification with the ballot, the Caltech-MIT Voting Technology Project strongly recommends that the Draft VSS be modified to require a voter session that is authenticated with the voter identification, and then within that authenticated session, the unidentified ballot be sent to the vote tallying location.
4. **Ballot validation: Standards for voter feedback:** Studies clearly indicate that providing voters with feedback during, or immediately after, the voting process significantly reduces unintentional voter errors, including undervotes and overvotes. The Caltech-MIT Voting Technology Project strongly urges that FEC incorporate a requirement in the Draft VSS for providing polling-place voter feedback. This feedback can be in the form of a "valid/invalid" indication visible only to the voter at the conclusion of voting, with the provision for the voter to revise the ballot if desired, or it could be in the form of a detailed summary of the undervote(s) or overvote(s) on the ballot, with the same provision for the voter to revise the ballot if desired. This requirement is present for DRE systems in Section 2.4.3.3 (h.-k.), and for Paper-Based systems in Section 2.4.3.2.2 (a.-b.). Illogically, however, Section 2.4.3.2.2.c. permits "an authorized election official to turn off" the ballot validation and feedback capabilities. This provision (2.4.3.2.2.c.) should be removed from the VSS.
5. **Length/Complexity of Voting Instructions:** Voting systems are used infrequently by the voting public. Studies have made clear that many voters are not well educated about how to use the voting system in their precinct. Standards should be mandated for voter instructions, and should include limitations on the complexity and length of the instructions needed to vote. The following Sections of the Draft VSS mention voter instructions: 2.2.7.2.b.2; 2.3.1.2; 2.4.3.3.k; and 3.4.18.a, but do not provide any standard for the length or complexity of such instructions. For example, Section 3.4.18.a simply states: "Instruction plates shall be provided, if they are necessary to avoid ambiguity or incorrect actuation". This is insufficient treatment of this important topic. The efficacy of these instructions should be evaluated with a test group of randomly chosen likely voters. A standard might include that voting instructions cannot exceed 200 words, and that at least 90% of test voters are able to operate the voting equipment without further instruction, and that the remaining 10% of the voters are able to operate the equipment with less than 5 minutes of verbal instruction from a typical poll worker.

6. **Multiple Languages:** The Draft VSS does not address the issue of multiple languages, except in Section 2.3.1.3.1.a. "The electronic display or printed document on which the user views the ballot is capable of rendering an image of the ballot in any of the languages required by The Voting Rights Act of 1965, as amended." It is important that the standards require consistent presentation of ballots and instructions in multiple languages, meaning that the same information is presented in each of the languages, and is done so in a consistent manner (e.g., similar typeface sizes, similar ballot layout, etc).
7. **Ballot design:** The Draft VSS does not sufficiently address the manner in which ballot information is presented to voters. These human-interface requirements are among the most crucial to establish. Additional requirements should be incorporated into the Draft VSS prohibiting butterfly ballots, prohibiting wraparound text, requiring all candidates for a particular office to be on the same page, in the same typeface, in the same size and shape area. Section 2.3.1.2 does not address this issue sufficiently.
8. **Open source software:** The Caltech-MIT Voting Technology Project strongly recommends that all software, at least for ballot counting and tallying, be "open source", meaning that the human-readable source code for the program(s) be available for public inspection. As with the other recommendations contained herein, the establishment and preservation of public trust in elections requires that the national voting system be open to public scrutiny. The standards may include proprietary voter interface software (ballot presentation and display, voter selections), but the tallying software must be open to public inspection.
9. **Periodic recertification:** All vote recording and tabulation equipment should require periodic recertification. In the current Draft VSS (Section 9.1), once a system is certified, it needs no recertification: "Generally a voting system remains qualified as long as no modifications are made to the system that have not been submitted to, and tested by, a certified ITA. The qualification test report remains valid for as long as the voting system remains unchanged." Recertification will ensure that unsatisfactory voting equipment is removed from the national voting system. The Caltech-MIT Voting Technology Project recommends that all equipment be recertified at least every 6 years, with electronic equipment requiring recertification at least every 2 years.
10. **Prohibit "Daisy-Chained" systems:** The standards should specifically prohibit voting systems that are "daisy-chained" together. Members of the Caltech-MIT Voting Technology Project have observed catastrophic failures of voting apparatus when an element in the middle of the "daisy-chain" fails, or the chain of connections is broken. Systems with this configuration should not be permitted under the standard. This requirement should be inserted immediately after Section 3.4.7 of the Draft VSS, and relate to **Signal Cable Disconnection**.
11. **Power Interruption:** Section 3.2.2.4 should require systems to automatically switch to battery power in the event of a power interruption, and to do so without

losing or corrupting data, and without interrupting normal operations of the equipment.

III. Typographical Suggestions for the 12/13/01 Draft VSS.

1. **2.3.2.c Election Programming:** "in which the user ..." should be changed to "in which the voter ..."
2. **2.4.3.2.2.a Precinct Count Paper-Based Systems:** "for which an overvote or an underrate ..." should be changed to "for which an overvote or an undervote ..."